

IN THE CLAIMS:

This listing of claims replaces all prior versions, and listings, of claims in the application:

1. (Currently amended) A method for operating a plasma enhanced chemical vapor deposition (PECVD) system to reduce wafer to wafer film thickness uniformity, the method comprising:

performing a chamber seasoning process; ~~wherein the chamber seasoning process comprises~~ comprising a chamber cleaning process, ~~or and~~ a chamber pre-coating process, ~~or a combination thereof~~, wherein the chamber cleaning process, ~~when employed~~, uses a remote plasma device, a first RF source, and a second RF source to form a plasma in a processing chamber with a fluorine-containing gas, an oxygen-containing gas, or an inert gas, or a combination of two or more thereof, and wherein the chamber pre-coating process, ~~when employed~~, uses a silicon-containing precursor, a carbon containing precursor, or an inert gas, or a combination of two or more thereof;

positioning a substrate on a substrate holder in the processing chamber;

depositing a film on the substrate, wherein a processing gas comprising a precursor is provided to the processing chamber during the deposition process; and

removing the substrate from the processing chamber; and
measuring the film on the substrate using an integrated metrology module configured to measure wafer film thickness.

2. (Original) The method as claimed in claim 1, further comprising:

positioning a new substrate on the substrate holder in the processing chamber;

depositing a film on the new substrate, wherein a processing gas comprising a precursor is provided to the processing chamber during the deposition process; and

removing the new substrate from the processing chamber.

3. (Original) The method as claimed in claim 2, further comprising:

performing a post-process chamber cleaning process, wherein the post-process chamber cleaning process uses a fluorine-containing gas, an oxygen-containing gas, or an inert gas, or a combination of two or more thereof.

4. (Original) The method as claimed in claim 3, wherein the post-process chamber cleaning process uses the fluorine-containing gas which comprises NF₃, CF₄, C₂F₆, C₃F₈, C₄F₈, SF₆, CHF₃, F₂, or COF₂, or a combination of two or more thereof

5. (Original) The method as claimed in claim 3, wherein the post-process chamber cleaning process uses the oxygen-containing gas which comprises H₂O, NO, N₂O, O₂, O₃, CO, or CO₂, or a combination of two or more thereof.

6. (Original) The method as claimed in claim 3, wherein the post-process chamber cleaning process uses the inert gas which comprises Ar, He, or N₂, or a combination of two or more thereof.

7. (Original) The method as claimed in claim 3, further comprising:
positioning a dummy substrate on the substrate holder before performing the post-process chamber cleaning process; and
removing the dummy substrate after performing the post-process chamber cleaning process.

8. (Original) The method as claimed in claim 2, wherein the film on the substrate comprises a Tunable Etch Resistant ARC (TERA) material, and the film on the new substrate comprises substantially the same TERA material.

9. (Original) The method as claimed in claim 1, wherein the film on the substrate comprises a Tunable Etch Resistant ARC (TERA) material.

10. (Original) The method as claimed in claim 1, further comprising:
positioning a dummy substrate on the substrate holder before performing the chamber seasoning process; and
removing the dummy substrate after performing the chamber seasoning process.

11. (Original) The method as claimed in claim 1, wherein the chamber seasoning process includes the chamber cleaning process and the chamber cleaning process employs the fluorine-containing gas comprising NF_3 , CF_4 , C_2F_6 , C_3F_8 , C_4F_8 , SF_6 , CHF_3 , F_2 , or COF_2 , or a combination of two or more thereof.

12. (Original) The method as claimed in claim 1, wherein the chamber seasoning process includes the chamber cleaning process and the chamber cleaning process employs the oxygen-containing gas comprising H_2O , NO , N_2O , O_2 , O_3 , CO , or CO_2 , or a combination of two or more thereof.

13. (Original) The method as claimed in claim 1, wherein the chamber seasoning process includes the chamber pre-coating process and the chamber pre-coating process employs the silicon-containing precursor comprising monosilane (SiH_4), tetraethylorthosilicate (TEOS), monomethylsilane (1MS), dimethylsilane (2MS), trimethylsilane (3MS), tetramethylsilane (4MS), octamethylcyclotetrasiloxane (OMCTS), tetramethylcyclotetrasilane (TMCTS), or dimethyldimethoxysilane (DMDMOS), or a combination of two or more thereof.

14. (Original) The method as claimed in claim 1, wherein the chamber seasoning process includes the chamber pre-coating process and the chamber pre-coating process employs the carbon-containing gas comprising CH_4 , C_2H_6 , C_2H_4 , C_2H_2 , C_6H_6 , or $\text{C}_6\text{H}_5\text{OH}$, or a combination of two or more thereof.

15. (Original) The method as claimed in claim 1, wherein the chamber seasoning process includes the chamber cleaning process and the chamber cleaning process employs the inert gas comprising Ar, He, or N_2 , or a combination of two or more thereof.

16. (Original) The method as claimed in claim 1, wherein the chamber seasoning process includes the chamber pre-coating process and the chamber pre-coating process employs the inert gas comprising Ar, He, or N_2 , or a combination of two or more thereof.

17. (Currently amended) The method as claimed in claim 1, wherein the ~~PECVD system comprises an RF source and the chamber seasoning process includes the chamber cleaning process which further comprises:~~

operating the first RF source in a frequency range from approximately 0.1 MHz. to approximately 200 MHz; and

operating the first RF source in a power range from approximately 0 watts to approximately 10000 watts.

18. (Currently amended) The method as claimed in claim 1, wherein the ~~PECVD system comprises an RF source and the chamber seasoning process includes the chamber pre-coating process which further comprises:~~

operating the first RF source in a frequency range from approximately 0.1 MHz. to approximately 200 MHz; and

operating the first RF source in a power range from approximately 0.1 watts to approximately 10000 watts.

19. (Currently amended) The method as claimed in claim 1, wherein the PECVD system comprises an upper electrode and a translatable substrate holder and the ~~chamber seasoning process includes the chamber cleaning process which further comprises:~~

establishing a first gap between the upper electrode and the translatable substrate holder during a first time; and

establishing a second gap between the upper electrode and the translatable substrate holder during a second time.

20. (Previously presented) The method as claimed in claim 19, wherein the first gap is less than or equal to the second gap.

21. (Previously presented) The method as claimed in claim 19, wherein the second gap is less than or equal to the first gap.

22. (Previously presented) The method as claimed in claim 1, wherein the PECVD system comprises a temperature control system coupled to a substrate holder and the chamber seasoning process includes the chamber cleaning process which further comprises controlling the substrate holder temperature between approximately 0° C. and approximately 500° C.

23. (Previously presented) The method as claimed in claim 1, wherein the PECVD system comprises a temperature control system coupled to a substrate holder and the chamber seasoning process includes the chamber pre-coating process which further comprises controlling the substrate holder temperature between approximately 0° C. and approximately 500° C.

24. (Previously presented) The method as claimed in claim 1, wherein the PECVD system comprises a pressure control system coupled to the chamber and the chamber seasoning process includes the chamber cleaning process which further comprises controlling the chamber pressure between approximately 0.1 mTorr and approximately 100 Torr.

25. (Previously presented) The method as claimed in claim 1, wherein the PECVD system comprises a pressure control system coupled to the chamber and the chamber seasoning process includes the chamber pre-coating process which further comprises controlling the chamber pressure between approximately 0.1 mTorr and approximately 100 Torr.

26. (Previously presented) The method as claimed in claim 1, wherein the PECVD system comprises a temperature control system coupled to a chamber wall and the chamber seasoning process includes the chamber cleaning process which further comprises controlling the chamber wall temperature between approximately 0° C. and approximately 500° C.

27. (Previously presented) The method as claimed in claim 1, wherein the PECVD system comprises a temperature control system coupled to a shower plate assembly and the chamber seasoning process includes the chamber cleaning process which further comprises controlling the shower plate assembly temperature between approximately 0° C. and approximately 500° C.

28. (Previously presented) The method as claimed in claim 1, wherein the film comprises a material having a refractive index (n) ranging from approximately 1.5 to approximately 2.5 when measured at a wavelength of at least one of: 248 nm, 193 nm, and 157 nm, and an extinction coefficient (k) ranging from approximately 0.1 to approximately 0.9 when measured at a wavelength of at least one of: 248 nm, 193 nm, and 157 nm.

29-34 (Withdrawn)